Doubly-differential cross sections for electron and positron impact ionization of argon

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The ionization of noble gas atoms in coplanar asymmetric geometry is one of the phenomena for which one can study competing interactions by using both electrons and positrons as projectiles. Double and triple differential cross sections (DDCS and TDCS) are particularly suitable for this task. Unfortunately the availability of intense positron beams continues to be a challenge and the number of experiments for these studies is quite small.

In a recent paper [1] we presented TDCS results for the ionization of argon by 1 keV electrons and positrons. We found that our distorted-wave model agrees reasonably well with the experiment of Dubois *et al* [2] after we included the experimental energy resolution.

In this work we present the variation of DDCS with the angles of the ejected electrons for the ionization of argon with 100 eV electrons and positrons. The energy of the ejected electrons is 15 eV. Experimentally this study was performed by Schmidt et al [3].

Figure 1 shows that the distorted-wave Born approximation (DWBA), with the post-collision interaction between the scattered particle and the ejected electron represented by the Ward-Macek model [4], produces a variation of DDCS which agrees well with the experiment for both electron and positron impact.

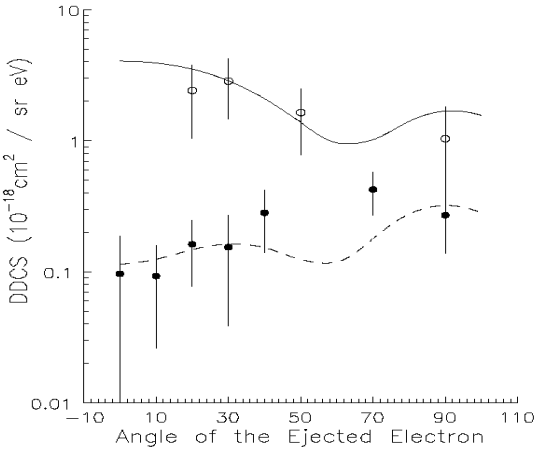

Figure 1. Double-differential cross sections for Ar ionization by 100 eV projectiles and for 15 eV ejected electrons. The continuous curve corresponds to our DWBA model for positron impact and the dashed curve to our DWBA model for electron impact. The experimental results are the relative measurements of Schmidt *et al* [3] scaled to fit our DWBA data an angle of the ejected electron equal to 30 degrees.

References

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[3] A. Schmitt *et al*, 1994, *Phys.Rev. .A* **49** R5

[4] S.J. Ward and J.H. Macek, 1994, *Phys. Rev.. A* **49** 1049

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